

CLAIMS

What is claimed is:

1. A copolymer comprising, in polymerized form:
 - (a) about 1 wt% to about 30 wt% of N-phenylmaleimide,
 - 5 N-cyclohexylmaleimide, N-benzylmaleimide, or a mixture thereof;
 - (b) about 1 wt% to about 30 wt% of acrylamide, methacrylamide, or a mixture thereof;
 - (c) about 20 wt% to about 75 wt% of acrylonitrile, methacrylonitrile, or a mixture thereof; and
 - 10 (d) a total of about 20 wt% to about 75 wt% of one or more monomers selected from monomers of the structure:

$$\text{CH}_2=\text{C}(\text{R}')-\text{Z}-\text{X}-\text{NHC}(\text{O})\text{NH}-\text{Y}-\text{OC}(\text{O})-\text{OR}''$$
 in which:

X is $-\text{C}(\text{CH}_3)_2-$ or $-(\text{CH}_2)_n-$, in which n is 0 to 12;

 - 15 Y is *o*-, *m*-, or *p*- $-\text{C}_6\text{H}_4-$;

Z is $-\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{O})\text{NH}-$, or *o*-, *m*-, or *p*- $-\text{C}_6\text{H}_4-$;

R' is hydrogen or C₁ to C₄ alkyl; and

R'' is C₁ to C₁₂ alkyl, C₁ to C₁₂ arylalkyl, C₁ to C₁₂ aryl, C₁ to C₁₂ alkenyl, or trimethylsilyl;

 - 20 in which the copolymer is soluble in alkaline solutions having a pH greater than 11.
2. The copolymer of claim 1 in which R'' is *t*-butyl.
3. The copolymer of claim 1 in which the copolymer comprises, in polymerized form, about 3 wt% to about 20 wt% of N-phenylmaleimide; about 5 wt%
 - 25 to about 2 wt% of methacrylamide; about 35 wt% to about 60 wt% of acrylonitrile; and a total of about 30 wt% to about 60 wt% of one or more monomers selected from the group consisting of the (d) monomers.

4. The copolymer of claim 3 in which the copolymer is soluble in alkaline solutions having a pH greater than at least about 12.

5. The copolymer of claim 4 in which R" is *t*-butyl.

6. The copolymer of claim 4 in which R' is hydrogen or methyl; X is
5 $-\text{[C(CH}_3)_2]-$ or $-\text{[(CH}_2)_2]-$; and Y is *p*-[C₆H₄]-.

7. The copolymer of claim 6 in which Z is $-\text{[C(O)O]}-$.

8. The copolymer of claim 7 in which the copolymer is soluble in alkaline solutions having a pH of from about 12 to about 14.

9. The copolymer of claim 8 in which R" is *t*-butyl.

10 10. The copolymer of claim 6 in which Z is *m*-[C₆H₄]-.

11. The copolymer of claim 10 in which the copolymer is soluble in alkaline solutions having a pH of from about 12 to about 14.

12. The copolymer of claim 11 in which R" is *t*-butyl.

13. The copolymer of claim 1 in which the copolymer is soluble in alkaline
15 solutions having a pH greater than at least about 12.

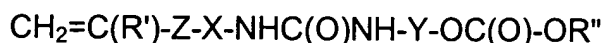
14. An imageable element comprising an imageable layer over a support, in which the imageable element comprises a photothermal conversion material and a copolymer comprising, in polymerized form:

(a) about 1 wt% to about 30 wt% of N-phenylmaleimide,
20 N-cyclohexylmaleimide, N-benzylmaleimide, or a mixture thereof;

(b) about 1 wt% to about 30 wt% of acrylamide, methacrylamide, or a mixture thereof;

(c) about 20 wt% to about 75 wt% of acrylonitrile, methacrylonitrile, or a mixture thereof; and

25 (d) a total of about 20 wt% to about 75 wt% of one or more monomers selected from monomers of the structure:



in which:

X is $-\text{C}(\text{CH}_3)_2-$ or $-(\text{CH}_2)_n-$, in which n is 0 to 12;

Y is *o*-, *m*-, or *p*- $-\text{C}_6\text{H}_4-$;

Z is $-\text{C}(\text{O})\text{O}-$, $-\text{C}(\text{O})\text{NH}-$, or *o*-, *m*-, or *p*- $-\text{C}_6\text{H}_4-$;

5 R' is hydrogen or C₁ to C₄ alkyl; and

R" is C₁ to C₁₂ alkyl, C₁ to C₁₂ arylalkyl, C₁ to C₁₂ aryl, C₁ to C₁₂ alkenyl, or trimethylsilyl;

in which:

the copolymer is soluble in alkaline solutions having a pH greater than 11:

10 and

the imageable element does not comprise a thermally activated acid generator.

15. The imageable element of claim 14 in which R" is *t*-butyl.

16. The imageable element of claim 14 in which the copolymer comprises,
15 in polymerized form, about 3 wt% to about 20 wt% of N-phenylmaleimide; about 5 wt% to about 2 wt% of methacrylamide; about 35 wt% to about 60 wt% of acrylonitrile; and a total of about 30 wt% to about 60 wt% of one or more monomers selected from the group consisting of the (d) monomers.

17. The imageable element of claim 16 in which the copolymer is soluble
20 in alkaline solutions having a pH greater than at least about 12.

18. The imageable element of claim 17 in which R" is *t*-butyl.

19. The imageable element of claim 18 in which the imageable element is a single layer imageable element, and the imageable layer comprises the copolymer, the photothermal conversion material, and (1) a first binder and a
25 dissolution inhibitor, (2) a first binder that comprises polar groups; or (3) a mixture thereof.

20. The imageable element of claim 19 in which R' is hydrogen or methyl;

X is $-\text{C}(\text{CH}_3)_2-$ or $-(\text{CH}_2)_2-$; and Y is $p\text{-}[\text{C}_6\text{H}_4]-$.

21. The imageable element of claim 20 in which the first binder is a novolac resin and the first binder that comprises polar groups is a novolac resin that comprises polar groups.

5 22. The imageable element of claim 21 in which Z is $-\text{C}(\text{O})\text{O}-$.

23. The imageable element of claim 22 in which R" is *t*-butyl.

24. The imageable element of claim 21 in which Z is $m\text{-}[\text{C}_6\text{H}_4]-$.

25. The imageable element of claim 24 in which R" is *t*-butyl.

10 26. The imageable element of claim 17 in which the element is a multilayer element comprising, in order, the imageable layer, an underlayer, and the substrate;

in which:

the imageable layer comprises (1) a novolac resin and a dissolution inhibitor, (2) a novolac that comprises polar groups; or (3) a mixture thereof; and

15 the underlayer comprises the copolymer and a second binder.

27. The imageable element of claim 26 in which R' is hydrogen or methyl; X is $-\text{C}(\text{CH}_3)_2-$ or $-(\text{CH}_2)_2-$; and Y is $p\text{-}[\text{C}_6\text{H}_4]-$.

20 28. The imageable element of claim 27 in which the photothermal conversion material is in the underlayer, and the second binder comprises, in polymerized form, about 25 to about 75 mol% of N-phenylmaleimide; about 10 to about 50 mol% of methacrylamide; and about 5 to about 30 mol% of methacrylic acid.

25 29. The imageable element of claim 28 in which the underlayer additionally comprises one of more resins having activated methylol or activated alkylated methylol groups.

30. The imageable element of claim 29 in which Z is $-\text{C}(\text{O})\text{O}-$.

31. The imageable element of claim 30 in which R" is *t*-butyl.

32. The imageable element of claim 29 in which Z is *m*-[C₆H₄]-.

33. The imageable element of claim 32 in which R" is *t*-butyl.

34. A method for forming an image, the method comprising the steps of:

thermally imaging an imageable element comprising an imageable layer over
 5 a support and forming an imaged imageable element comprising imaged and
 unimaged regions in the imageable layer;

developing the imaged imageable element with a developer and removing
 the imaged regions to form a printing plate comprising the image; and

baking the printing plate;

10 in which:

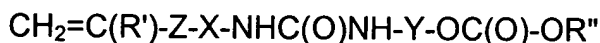
the imageable element comprises the imageable element comprises a
 photothermal conversion material and a copolymer comprising, in polymerized form:

(a) about 1 wt% to about 30 wt% of N-phenylmaleimide,
 N-cyclohexylmaleimide, N-benzylmaleimide, or a mixture thereof;

15 (b) about 1 wt% to about 30 wt% of acrylamide, methacrylamide, or a
 mixture thereof;

(c) about 20 wt% to about 75 wt% of acrylonitrile, methacrylonitrile, or a
 mixture thereof; and

20 (d) a total of about 20 wt% to about 75 wt% of one or more monomers
 selected from monomers of the structure:



in which:

X is -[C(CH₃)₂]- or -[(CH₂)_n]-, in which n is 0 to 12;

Y is *o*-, *m*-, or *p*- [C₆H₄]-;

25 Z is -[C(O)O]-, -[C(O)NH]-, or *o*-, *m*-, or *p*- [C₆H₄]-;

R' is hydrogen or C₁ to C₄ alkyl; and

R" is C₁ to C₁₂ alkyl, C₁ to C₁₂ arylalkyl, C₁ to C₁₂ aryl, C₁ to C₁₂ alkenyl, or trimethylsilyl;

the copolymer is soluble in alkaline solutions having a pH greater than 11;

the imageable element does not comprise a thermally activated acid

5 generator; and

the developer has a pH of at least about 11.

35. The method of claim 34 in which R" is *t*-butyl.

36. The method of claim 35 in which the copolymer comprises, in
polymerized form, about 3 wt% to about 20 wt% of N-phenylmaleimide; about 5 wt%
10 to about 2 wt% of methacrylamide; about 35 wt% to about 60 wt% of acrylonitrile;
and a total of about 30 wt% to about 60 wt% of one or more monomers selected
from the group consisting of the (d) monomers.

37. The method of claim 36 in which the copolymer is soluble in alkaline
solutions having a pH greater than at least about 12 and the developer has a pH of
15 at least about 12.

38. The method of claim 37 in which R' is hydrogen or methyl; X is
-[C(CH₃)₂]- or -[(CH₂)₂]-; and Y is *p*-[C₆H₄]-.

39. The method of claim 38 in which the copolymer is soluble in alkaline
solutions having a pH of about 12 to about 14 and the developer has a pH of about
20 12 to about 14.